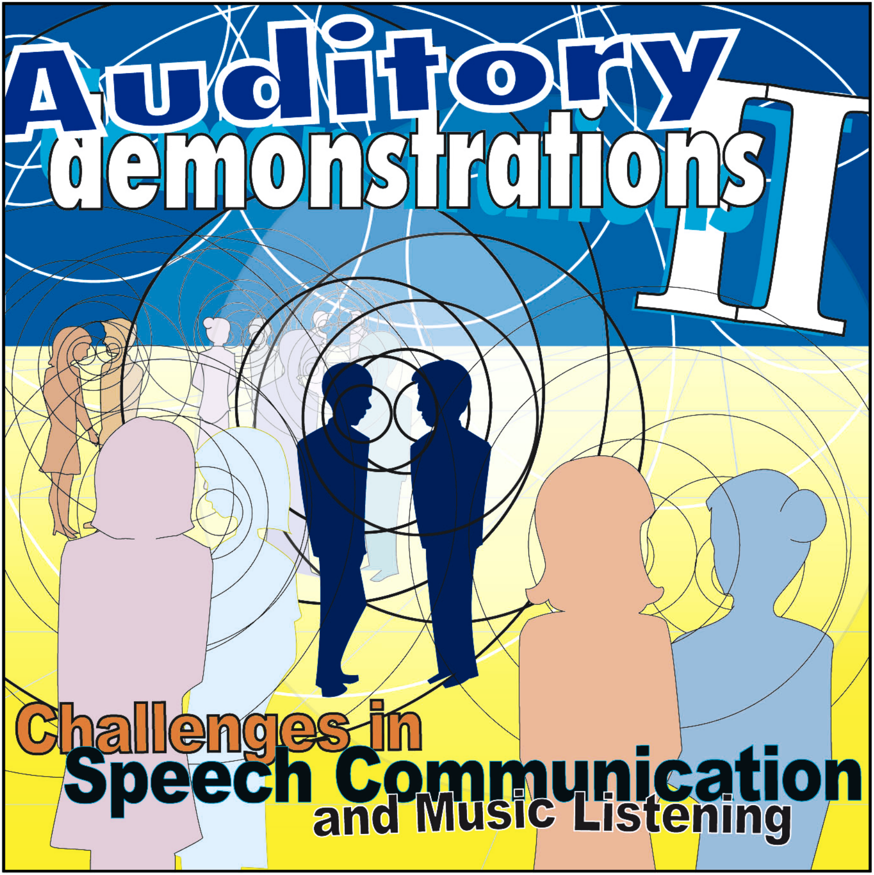
Auditory
demonstrations
II
Challenges in
Speech Communication
and Music Listening

AUDITORY DEMONSTRATIONS II

Challenges in Speech Communication and Music Listening

Distributed by the Acoustical Testing Laboratory,
NASA Glenn Research Center
http://acousticaltest.grc.nasa.gov

INTRODUCTION

AUDITORY DEMONSTRATIONS II

Challenges to Speech Communication and Music Listening

Introduction

Noise affects our lives in many different situations. At high sound levels, ongoing exposure can lead to noise-induced hearing loss. Even at low levels some sounds can cause annoyance or distraction. Within this continuum lies a vast range of experiences that encompass most of our daily lives including workplaces, vehicles, restaurants, etc., where the chief noise complaint is usually difficulty in understanding speech. The difficulty only increases when the environment is highly reverberant and/or the listener has hearing loss. The NASA Glenn Research Center Acoustical Testing Laboratory has produced this collection of auditory demonstrations to illustrate the impact of acoustical conditions and hearing loss on everyday listening situations. In addition, recordings of several styles of music have been modified to demonstrate auditory changes due to progressive noise-related hearing loss. These audio demonstrations illustrate both the need for and the benefits of noise control efforts in a wide range of situations where good speech intelligibility is desirable.   They are intended as tools with which engineers, designers, architects, policymakers, and others can more accurately assess the true cost of communication interference due to noise.

It is more difficult to motivate noise control efforts for the sake of speech intelligibility than for hearing conservation because it is generally perceived that noise interference with speech is merely an inconvenience. Furthermore, it is easy to adopt a variety of coping mechanisms, such as speaking up and moving nearer to the speaker. However, these mechanisms may not be practical or sustainable in some communication situations.

INTRODUCTION

These audio demonstrations place the listener in the middle of challenging real-life situations without recourse to the usual coping mechanisms. The inability to adapt to the situation dramatically highlights the need for noise control. While these demonstrations might appear to be artificial or restricted to a given listening situation, the demonstrations have been carefully constructed to represent appropriate sound levels from participants in actual conversations, with corresponding acoustical conditions.

For more information and to request additional single copies of this CD, visit the NASA Glenn Research Center Acoustical Testing Laboratory website at http://acousticaltest.grc.nasa.gov.

Description of Speech Communication Demonstrations

Demonstrations cast the listener as a third-party listener to a situation-appropriate conversation in the following arbitrarily chosen environments of interest:

1. spacecraft interiors
2. automobile passenger compartments
3. aircraft passenger cabins
4. meeting rooms
5. restaurants
6. industrial facilities
7. classrooms

The scripts are intended to be compelling and entertaining, so that loss of speech intelligibility can be expected to create a sense of frustration.

DESCRIPTION OF SPEECH COMMUNICATION DEMONSTRATIONS

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The speakers do not raise or lower their voices, nor do they move relative to the listener. Ambient sounds native to a number of environments are presented at appropriate levels. They are presented singly or in sequence, usually from best to worst speech intelligibility. For some tracks, broadband noise has been synthesized to match Noise Criterion (NC) curves. In tracks 15, 16, 20, and 21, sounds intruding into the listening space are filtered to simulate performance of various partitions ranging from Sound Transmission Class (STC) 20 to 60.[1]

On most tracks, the listener is assumed to have no hearing loss. Some tracks are filtered so that a normal-hearing person can experience hearing loss that might be predicted (based on ISO 1999) for exposure to 90 dBA (unprotected, or at the ear) for 8 hours per day over a period of years.[2]

Other tracks are filtered to simulate use of hearing protectors with rated attenuation ranging from Noise Reduction Rating (NRR) 12 to 29.[3]

Finally, on some tracks digital reverberation has been added to increase realism and to demonstrate the effects of reverberation on speech intelligibility.

Transitions between steps in most sequences are indicated by an audible tone.

Description of Music Listening Demonstrations

A demonstration of music listening with progressive sensorineural hearing loss was included on this CD's predecessor disc, "Auditory Demonstrations in Acoustics and Hearing Conservation." (Single copies are available on request at http://acousticaltest.grc.nasa.gov.) The original demonstrations used a passage of classical music, repeated with successive low pass filters. Each of the updated presentations on this CD uses a single passage of music, drawn from one of many popular styles, which has been sequentially filtered to more accurately reflect hearing loss characteristics drawn from ISO 1999. The filters are generated with median hearing loss (HL) values (which include hearing loss due to aging) for an unscreened population exposed for 8 hours per day to 90 dBA (unprotected, or at the ear) for 0, 5, 10 . . . 40 years. The filter reverts to the 0 year case (undamaged, young ears) at the end of each presentation.

Matrix of "Challenges" Demonstrated

The following matrix summarizes the issues addressed and their corresponding track numbers. Detailed track descriptions follow and are available at http://acousticaltest.grc.nasa.gov.

	Interior Ambient Noise	Intruding Ambient Noise	Hearing Loss	Hearing Protectors	Reverberation
ISS	4, 5, 6		7, 8		
Automobile	9		10		
Restaurant	12		13		
Meeting Room	17	15, 16			18
Classroom	21	20, 21			21
Aircraft	23		24		
Industrial	26		26, 29-32	28-32	
Music			35-44		

CREDITS

Credits

Producer, Technical Sound Design	David Nelson, INCE BD. Cert.; Nelson Acoustical Engineering, Inc.
Studio	Tequila Mockingbird, Austin, TX
Creative Director, Scriptwriter	Wally Williams; Tequila Mockingbird
Recording Engineers	Matt Ludwick, Shayna Levin; Tequila Mockingbird
Voice Talent	Angie Johnson, Julie Foust, Damon Brown, Darin Murphy, A.J. Audain; Tequila Mockingbird
Announcer	Richard W. Danielson, Ph.D.; NSBRI/Baylor College of Medicine; Manager for Audiology and Hearing Conservation, NASA Johnson Space Center
Artwork	Nicholas Hawes; Cleveland Institute of Art

References

[1]Information about NC and STC curves:
Cyril M. Harris, ed., **Noise Control in Buildings**, McGraw-Hill Inc., New York, NY, 1994

[2]Hearing loss predictions taken from:
ISO 1999–1990. "Acoustics— Determination of occupational noise exposure and estimation of noise-induced hearing impairment," International Organization for Standardization, Case Postale 56, CH–1211 Geneve 20, Switzerland. http://www.iso.ch

[3]Information on NRR of hearing protectors:
Berger, EH, Royster, LH, Driscoll, DP, Royster, JD, and Layne, M (2000). **The Noise Manual (Fifth Edition).** American Industrial Hygiene Association, Fairfax VA.

COMMUNICATION DEMONSTRATIONS

Annotated Track Listing

1. **"Sundial"**— Dialog of normal running speech, can be used to make initial volume adjustments using listener comfort level.

2. **Introduction**

3. **Calibration Tone**: 70 dB band of noise, $^1/_3$-octave width, centered at 1 kHz (applies to tracks 4 through 21).

4. **International Space Station (ISS), Raw Audio**. Speech (presented at 58 dBA) vs. background (presented at 51 dBA). The presented levels are intended to generally approximate, but do not accurately reflect, the average background sound levels on ISS.

5. **ISS Scripted Speech vs. Increasing NC Sequence.** Speech (58 dBA) vs. artificial background (NC 40 increasing to NC 60; see Appendix A). Each "beep" denotes an increase of five NC points. Speech intelligibility should become increasingly difficult above NC 50.

6. **ISS Scripted Speech vs. Decreasing NC Sequence.** Speech (58 dBA) vs. artificial background (NC 60 decreasing to NC 40; see Appendix A). Each "beep" denotes a decrease of five NC points. Speech intelligibility should become increasingly less difficult below NC 50.

7. **ISS Scripted Speech vs. Increasing NC Sequence, Filtered for Hearing Loss**. Speech (58 dBA) vs. artificial background (NC 40 to 60; see Appendix A), filtered to simulate hearing loss due to 40 years of exposure at 90 dBA, 8 hours per day (see Appendix B). Each "beep" denotes an increase of five NC points. Significant hearing loss renders speech intelligibility somewhat more difficult, particularly in the transitional range, around NC 50 (i.e., after the third "beep").

8. **ISS Scripted Speech vs. NC-50 Background with Progressive Hearing Loss.** Speech (58 dBA) vs. background (NC 50, 58 dBA), filtered to simulate 40 years of progressive noise-induced hearing loss (see

Appendix B). Each “beep” denotes an additional 5-year increment of hearing loss. Increasing hearing loss reduces speech intelligibility, especially beyond 25 years.

9. **Automobile Conversation vs. Various Interior Sounds.** Speech (66 dBA) vs. succession of automobile interior sounds introduced at fixed intervals. The automobile passenger environments become progressively louder (60 dBA to 70 dBA). Other sources of speech interference in automobiles (such as climate control blowers, music systems, and open windows) have not been included.

10. **Automobile Conversation vs. Typical Interior Sound with Progressive Hearing Loss.** Speech (66 dBA) vs. a selected moderate automobile interior sound (64 dBA), filtered to simulate 40 years of progressive noise-induced hearing loss (see Appendix B). Each “beep” denotes an additional 5-year increment of hearing loss. Increasing hearing loss reduces speech intelligibility, especially beyond 25 years.

11. **"Claire"**— Script from Tracks 10 and 11 (66 dBA) presented without interference.

12. **Restaurant Conversation vs. Various Environments.** Speech (66 dBA) vs. a succession of restaurant sounds introduced at fixed intervals. The restaurant environments become progressively louder (55 dBA to 75 dBA), overshadowing much of the spoken text. The restaurant sounds are reproduced at their actual levels. (Yes, some restaurants really can be this loud!)

13. **Restaurant Conversation vs. Typical Environment with Progressive Hearing Loss.** Speech (66 dBA) vs. typical restaurant sound (67 dBA), filtered to simulate 40 years of progressive noise-induced hearing loss (see Appendix B). Each "beep" denotes an additional 5-year increment of hearing loss. Increasing hearing loss reduces speech intelligibility, especially beyond 25 years.

14. **"Five Star"—** Script from Tracks 21 and 13 (69 dBA) presented without interference.

15. **Lecture Hall Crosstalk Scenario.** Speech (63 dBA) vs. an amplified rally in adjacent space (85 dBA filtered through STC 25 wall partition; see Appendix C). The amplified crosstalk is loud enough to interfere with speech intelligibility.

16. **Lecture Hall Crosstalk with Increasing Partition Performance.** Speech (63 dBA) vs. rally in adjacent conference room (85 dBA filtered through a succession of partitions STC 20 through STC 60; see Appendix C). Each "beep" denotes an increase in partition performance of five STC points. A partition of STC 40 or more is typically sufficient to eliminate interference with speech intelligibility, but the crosstalk is still audible up through STC 55.

17. **Lecture Hall Speech vs. Increasing NC Sequence.** Speech (63 dBA) vs. artificial background (NC 30 increasing to NC 50, see Appendix A). Each "beep" denotes an increase of five NC points in the background noise. The lecture hall environment should ideally be NC 30 (or less). Notice that although speech is still intelligible at higher

levels, the noisier environments are inappropriately loud.

18. **Lecture Hall Speech vs. Increasing Reverberation Time.** Speech (63 dBA) vs. artificial reverberation. The reverberation time increases from 0.0 to 4.0 seconds. The listener is located in the reverberant field at some distance from the speaker. The shorter reverberation times add significant coloration to the sound but do not affect speech intelligibility. Each "beep" denotes transition to the next level of reverberation. The sequence of reverberation times, in seconds, is 0.000, 0.125, 0.250, 0.500, 0.875, 1.250, 2.000, 2.700, 4.000.

19. **"Artificial Intelligence"—** Script from Tracks 15 through 18 (63 dBA) presented without interference.

20. **Classroom Instruction vs. Environmental Noise.** Speech (64 dBA) vs. various environmental noises (highway traffic 70 dBA and locomotive and aircraft 80 dBA). For the first 30 seconds the environmental noises are filtered to simulate a poor exterior

partition (STC 20 dB; see Appendix C). After that time the environmental noises are repeated and filtered to simulate an improved partition (STC 35; see Appendix C). The final environment just conforms to ANSI S12.60 guidelines for classrooms. (ANSI S12.60-2002 "Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools," Acoustical Society of America, Standards Secretariat, 35 Pinelawn Road, Suite 114 E, Melville, New York 11747-3177, http://asa.aip.org)

21. **Classroom Instruction vs. Interior Noise.** Speech (64 dBA) vs. various internal building noises. Initially, the speech is subjected to a reverberation time of 1.25 seconds and must compete with HVAC noise (50 dBA, NC 45) and a nearby basketball practice (73 dBA) filtered to simulate a poorly performing door to the corridor (STC 20). After 11 seconds, the basketball practice noise is filtered to simulate substitution of an improved STC 40 door. Beginning at 22 seconds, the HVAC noise is reduced three times in 5 dB increments to 35 dBA (NC 30). It is interesting to note that the basketball

practice is once again audible, although barely, because the masking of the HVAC noise has been removed. At about 45 seconds, the reverberation is reduced to 0.50 seconds. The final environment just conforms to ANSI S12.60 guidelines for classrooms.

22. **Calibration Tone**: 70 dB band of noise, 1/3-octave width, centered at 1 kHz. Applies to tracks 22 through 34.

23. **Aircraft Conversation vs. Various Cabin Sounds.** Speech (76 dBA) vs. succession of aircraft interior sounds (75 dBA to 83 dBA) introduced at fixed intervals. The aircraft environments become progressively louder, overshadowing much of the spoken text. The aircraft sounds are reproduced at their actual levels, with the exception that the level of the final environment of the sequence has been *reduced* somewhat.

24. **Aircraft Conversation vs. Typical Cabin Sound with Progressive Hearing Loss.** Speech (76 dBA) vs. selected aircraft interior sound (75 dBA), filtered to simulate 40

years of progressive noise-induced hearing loss (see Appendix B). Each "beep" denotes an additional 5-year increment of hearing loss. Increasing hearing loss reduces speech intelligibility, especially beyond 25 years.

25. **"Helmet"**— Script from Tracks 23 and 24 (76 dBA) presented without interference.

26. **Industrial Conversation vs. Various Industrial Environments.** Speech (75 dBA) vs. a succession of industrial backgrounds (72 dBA to 81 dBA) introduced at fixed intervals. The industrial environments become progressively louder, overshadowing much of the spoken text.

27. **Industrial Conversation vs. Typical Industrial Environment with Progressive Hearing Loss.** Speech (75 dBA) vs. a typical industrial environment (74 to 77 dBA) filtered to simulate 40 years of progressive noise-induced hearing loss (see Appendix B) in 5-year increments. Each "beep" denotes an additional 5-year increment of hearing loss. Increasing hearing loss reduces speech intelligibility, especially beyond 25 years.

28. **Industrial Conversation vs. Typical Industrial Environment with Progressively Stronger Hearing Protectors.** Speech (75 dBA) vs. a typical industrial environment (74 to 77 dBA) filtered to simulate use of hearing protectors. The demonstration includes initial and final unfiltered segments and filters introduced at regular intervals (denoted by a "beep") to simulate use of various popular hearing protectors (NRR 12 to 29; see Appendix D).

29. **Industrial Conversation vs. Typical Industrial Environment, "Foam" Plug and Progressive Hearing Loss.** Speech (75 dBA) vs. a typical industrial environment (74 to 77 dBA) filtered to simulate listening with a foam plug hearing protector (NRR 29, see Appendix D) and 40 years of progressive noise-induced hearing loss (see Appendix B) in 5-year increments. No unfiltered segments are used in this demonstration. Each "beep" denotes an additional 5-year increment of hearing loss. Increasing hearing loss does not reduce speech intelligibility as might be expected because the hearing protector has already attenuated virtually all of the high-

frequency sound. Levels are very low because of the considerable attenuation associated with this type of hearing protector.

30. **Industrial Conversation vs. Typical Industrial Environment, "Flat" Plug and Progressive Hearing Loss.** Speech (75 dBA) vs. a typical industrial environment (74 to 77 dBA) filtered to simulate presence of a plug-type hearing protector with a flat attenuation curve (NRR 12; see Appendix D) and 40 years of progressive noise-induced hearing loss (see Appendix B) in 5-year increments. No unfiltered segments are used in this demonstration. Each "beep" denotes an additional 5-year increment of hearing loss. Increasing hearing loss reduces speech intelligibility, especially beyond 25 years.

31. **Industrial Conversation vs. Typical Industrial Environment, "Foam" Plug and Progressive Hearing Loss.** Identical to Track 29 but with 15 dB gain applied throughout for more convenient listening.

32. **Industrial Conversation vs. Typical Industrial Environment, "Flat" Plug and Progressive Hearing Loss.** Identical to Track 30 but with 15 dB gain applied throughout for more convenient listening.

33. **"Sales Spiel"—** Script from Tracks 26 through 32 (75 dBA) presented without interference.

34. **Personal Music Headphones in Industrial Environment.** This demonstration depicts the potential results of wearing personal music headphones in an industrial environment. The industrial environment (78 dBA) would not typically require hearing protection in order to avoid significant hearing loss, but one worker in the scenario chooses to drown out the sound using personal music headphones. In order to obtain a satisfactory listening experience, the listener typically operates personal music headphones at a level at least 10 dBA greater than that of the host environment. This scenario is depicted in the first segment of the track. For the sake of this demonstration, it is assumed that the listener operated his headphones at 90 dBA

for the bulk of his career, and in so doing incurred significant hearing loss.

The demonstration consists of two parts. The first part depicts a discussion in the manufacturing area, which demonstrates the relative level of the personal music headphones. The second part depicts a retirement banquet, filtered to simulate the hearing loss incurred by the worker during the 30-year period.

a. Speech (82 dBA) vs. Industrial Environment (80 dBA).

b. Speech (70 dBA) vs. Restaurant Environment (64 dBA), filtered to simulate hearing loss (40 years of exposure at 90 dBA, 8 hours per day; see Appendix B).

35.–44. Music “Meltdowns.”

Musical selections are filtered to simulate 40 years of progressive noise-induced hearing loss (see Appendix B) in 5-year increments, with each 5-year increment indicated by a “beep.” At the end of the selection, the filtering is removed.

The music is still audible and for the most part intelligible, although certainly far less enjoyable. The musical source material for each demonstration is as follows:

35. **Pop: “*Up and Away,*”**
Killer Tracks #147, Track 1
36. **Rap: “It’s a Groove Thing,”**
KOKA #2182, Track 2
37. **Rock: “Sweatin’ Mass,”**
XCD #068, Track 2
38. **Country: “Like I Feel Right Now,”**
KOKA 2163, Track 5
39. **Latin: “Perrito Caliente,”**
APM Best-20, Track 11
40. **Techno: “Sweat Shop,”**
XCD 049, Track 7

MUSIC “MELTDOWNS”

MUSIC
"MELTDOWNS"

41. **Jazz: "As Good as it Gets,"**
XCD 023, Track 3

42. **Classical: Symphony in A Major, No. 4, Op. 90 "*Italian*,"** by Felix Mendelssohn, recorded at Kulas Hall, Cleveland Institute of Music, October 17, 2001. Performed by the CIM Orchestra, Carl Topilow, conductor, Alan Bise recording engineer. Thanks to Paul Blakemore for help with this track.

43. **Big Band: "Twilight Time,"**
KOKA #2060, Track 1

44. **Swing: "Gypsy Rag,"**
KOKA #2121, Track 1

Unfiltered (Original) Music

45. **Classical: Symphony in A Major, No. 4, Op. 90 "*Italian*,"** Felix Mendelssohn

Appendix A
Artificial Environments: NC Curves

Noise Criterion Curve	Octave Band Sound Pressure Level [dB]							
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
NC 15	47	36	29	22	17	14	12	11
NC 20	51	40	33	26	22	19	17	16
NC 25	54	44	37	31	27	24	22	21
NC 30	57	48	41	35	31	29	28	27
NC 35	60	52	45	40	36	34	33	32
NC 40	64	56	50	45	41	39	38	37
NC 45	67	60	54	49	46	44	43	42
NC 50	71	64	58	54	51	49	48	47
NC 55	74	67	62	58	56	54	53	52
NC 60	77	71	67	63	61	59	58	57
NC 65	80	75	71	68	66	64	63	62

APPENDICES

Appendix B: Progressive Sensorineural Hearing Loss*

Exposure Duration	Hearing Loss [dB]					
	500 Hz	1000 Hz	2000 Hz	3000 Hz	4000 Hz	6000 Hz
5 Yrs	0	0	0	5	8	5
10 Yrs	1	1	3	10	13	9
15 Yrs	1	1	5	12	15	12
20 Yrs	2	2	7	14	18	15
25 Yrs	3	3	9	17	22	19
30 Yrs	4	4	12	20	25	23
35 Yrs	5	6	14	23	29	28
40 Yrs	6	7	17	27	34	34

*50th percentile, average male/female, 90 dBA exposure, 8 hours per day, per ISO 1999.

Appendix C:
Building Components, Insertion Loss

Sound Transmission Class	Octave Band Insertion Loss [dB]							
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
STC 20	6	10	18	20	20	20	19	20
STC 25	5	12	21	25	26	26	25	26
STC 30	7	12	21	27	30	31	29	31
STC 35	11	18	26	34	36	36	36	37
STC 40	16	18	26	37	46	44	43	54
STC 45	18	23	35	44	51	48	44	56
STC 50	19	27	38	48	54	53	52	64
STC 55	18	29	45	55	57	59	57	66
STC 60	22	35	49	60	61	63	62	71

STC 20: 89% of area is wall of $^1/_2$-inch gypsum board both sides on nominal 2 by 4 studs on 16- inch centers, 10% of area is solid core wood door, no seals, 1% of area leaks.

STC 25: 90% of area is wall of $^1/_2$-inch gypsum board both sides on nominal 2 by 4 studs on 16- inch centers, 10% of area is solid core wood door, no seals, 0.2% of area leaks.

STC 30: 66% of area is wall of $^1/_2$-inch gypsum board both sides on nominal 2 by 4 studs on 16-inch centers, 34% of area is $^1/_8$-inch glass, 0.05% of area leaks.

STC 35: 2 layers $^1/_2$-inch gypsum board on one side, 1 layer $^1/_2$-inch gypsum board on the other, $2^1/_2$-inch steel studs, 0.02% leaks

STC 40: 2 layers $^1/_2$-inch gypsum board on one side, 1 layer $^1/_2$-inch gypsum board on the other, $2^1/_2$-inch steel studs, no leaks

STC 45: 2 layers $^1/_2$-inch gypsum board on one side, 1 layer $^1/_2$-inch gypsum board on the other, 3-5/8-inch steel studs on 24-inch centers, no leaks

STC 50: 2 layers $^1/_2$-inch gypsum board each side of $2^1/_2$-inch steel studs, no leaks

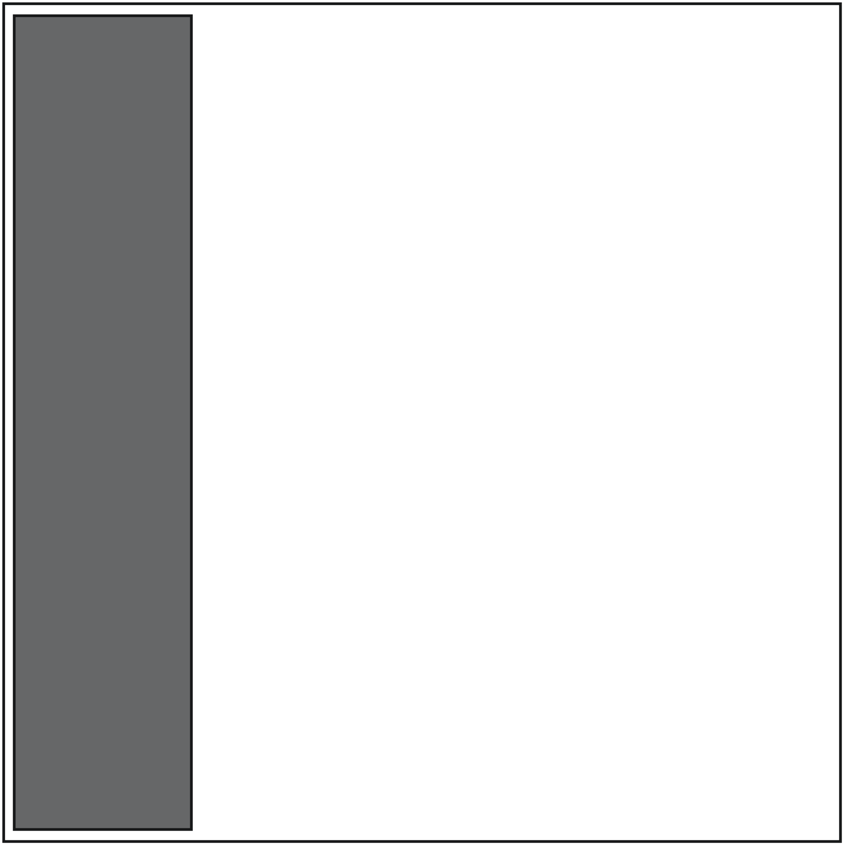
STC 55: 2 layers $^1/_2$-inch gypsum board, resilient channels, $3^5/_8$-inch steel studs, 3-inch mineral fiber cavity insulation, 1 layer $^1/_2$-inch gypsum board, no leaks

STC 60: 2 layers $^{1}/_{2}$-inch gypsum board, resilient channels, $3^{5}/_{8}$-inch steel studs, 3-inch mineral fiber cavity insulation, 2 layers $^{1}/_{2}$-inch gypsum board, no leaks

Appendix D: Hearing Protectors, Attenuation Data*

Noise Reduction Rating	Octave Band Attenuation [dB]								
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	3150 Hz	4000 Hz	6300 Hz	8000 Hz
NRR 12	15	15	17	19	23	23	20	22	25
NRR 16	12	17	24	23	24	27	25	23	26
NRR 20	12	16	27	32	33	35	38	42	42
NRR 25	17	22	34	40	35	36	38	38	40
NRR 29	37	41	45	44	36	42	43	46	47

*http://www.aearo.com/html/products/hearing/atten01.htm



TRACKS

Communication Demonstrations

1. "Sundial" (2:03)
2. Introduction (0:45)
3. Calibration Tone (0:41)
4. International Space Station (ISS), Raw Audio (0:42)
5. ISS Scripted Speech vs. Increasing NC Sequence (0:40)
6. ISS Scripted Speech vs. Decreasing NC Sequence (0:41)
7. ISS Scripted Speech vs. Increasing NC Sequence, Filtered for Hearing Loss (0:43)
8. ISS Scripted Speech vs. NC-50 Background with Progressive Hearing Loss (0:44)
9. Automobile Conversation vs. Various Interior Sounds (1:06)
10. Automobile Conversation vs. Typical Interior Sound with Progressive Hearing Loss (1:13)
11. "Claire" (0:58)
12. Restaurant Conversation vs. Various Environments (1:08)
13. Restaurant Conversation vs. Typical Environment with Progressive Hearing Loss (1:15)
14. "Five Star" (0:55)
15. Lecture Hall Crosstalk Scenario (1:23)
16. Lecture Hall Crosstalk with Increasing Partition Performance (1:29)
17. Lecture Hall Speech vs. Increasing NC Sequence (0:44)
18. Lecture Hall Speech vs. Increasing Reverberation Time (1:30)
19. "Artificial Intelligence" (1:17)
20. Classroom Instruction vs. Environmental Noise (1:28)
21. Classroom Instruction vs. Interior Noise (1:12)
22. Calibration tone (0:41)
23. Aircraft Conversation vs. Various Cabin Sounds (1:06)
24. Aircraft Conversation vs. Typical Cabin Sound with Progressive Hearing Loss (1:11)
25. "Helmet" (0:54)
26. Industrial Conversation vs. Various Industrial Environments (1:08)
27. Industrial Conversation vs. Typical Industrial Environment with Progressive Hearing Loss (1:14)
28. Industrial Conversation vs. Typical Industrial Environment with Progressively Stronger Hearing Protectors (1:12)
29. Industrial Conversation vs. Typical Industrial Environment, "Foam" Plug and Progressive Hearing Loss (1:18)
30. Industrial Conversation vs. Typical Industrial Environment, "Flat" Plug and Progressive Hearing Loss (1:18)
31. Track 29 with 15 dB gain (1:18)
32. Track 30 with 15dB gain (1:18)
33. "Sales Spiel" (0:56)
34. Personal Music Headphones in Industrial Environment (1:02)

Music "Meltdowns"

35. Pop: "Up and Away" (1:04)
36. Rap: "It's a Groove Thing" (0:54)
37. Rock: "Sweatin' Mass" (0:59)
38. Country: "Like I Feel Right Now" (1:09)
39. Latin: "Perrito Caliente" (1:05)
40. Techno: "Sweat Shop" (1:08)
41. Jazz: "As Good as it Gets" (0:54)
42. Classical: Symphony in A Major, No. 4, Op.90 "Italian" - Felix Mendelssohn (1:19)
43. Big Band: "Twilight Time" (0:59)
44. Swing: "Gypsy Rag" (1:06)

Unfiltered (Original) Music:

45. Classical: Symphony in A Major, No. 4, Op. 90 "Italian" - Felix Mendelssohn (11:00)